

only other observation I ever made, in which I was satisfied by ocular demonstration of the identity of the phenomenon, was the height of an auroral arch with a base of nineteen miles which gave a height of only 15,000 feet. With regard to the intensity of the light on the occasion just referred to, viz. Oct. 24, 1870, it may be worth recording that, great as was the amount of light pervading the atmosphere, no portion of it, not even the corona, was capable of being seen by reflexion in the centre of the river.

Streatley Vicarage, June 4th, 1872.

Observations of the Solar Prominences, from Jan. 1 to April 29.
By Father Secchi, Director of the Roman Observatory.

Father Secchi communicates to the Paris Academy his observations of the prominences during the four solar rotations ending April 29, thus completing, with the observations already recorded (see *Monthly Notices* for March), an entire year of observations. In this period there were fifty-nine days of complete observations.

During this interval, the law was confirmed, which gave a maximum of prominences in the region of spots, and a minimum of the equator. But the relative maximum in the polar zones was scarcely sensible.

“The general absence of polar prominences,” proceeds Secchi, “during the interval was remarkable.” They were replaced by sensible elevations of the chromatosphere. Counting only as prominences those whose height reached or surpassed forty seconds, prominences were found to be very rare.

“The aspect of the granulations, and of the brighter bands around the polar zones, corresponded with this absence of polar prominences; as the former could scarcely be recognised, while last year they were very visible.

“The intensity and number of the faculæ are also diminished.

“Dividing the prominences into three classes, according to their direction with respect to the poles, the following numbers are obtained:—

Indifferent	..	398
Directed towards the poles..	..	342
Directed towards the equator	..	67
Total		807

“In the observations, especially the later ones, great attention has been paid to the direction of the threads or hairs of the chromatosphere, and the results obtained have been the following:—

“In general, in mean latitudes, the threads are also directed towards the poles, but there are numerous exceptions, especially in the neighbourhood of prominences, spots, and granulations. At the equator and poles, there are no constant rules.

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“The variability of this inclination is often astonishing at one and the same place. It even appears to change during the observation, in such sort that I have often been the victim of an illusion; but a sustained attention, in the clearer days, has proved that this variability is real. One would be tempted to compare this diffusion to a species of very variable electric sparkling, rather than to an emission of real matter: but it would be premature to pronounce, and we do not pretend here to prejudge the true interpretation. It is necessary to mention that sometimes, when the hairs are very fine, they appear divided into two opposite directions, with respect to the slice of the chromatosphere limited by the border of the slit. All the circumstances show how difficult these observations are, and how much yet remains to be cleared up.

“One of the most remarkable peculiarities attracting attention in these researches, is the fixity of the chromatospheric layer and its features, amidst the apparent agitation of the solar edge. It is truly astonishing to see the streak adorned with fringes and hairs of the utmost delicacy, resting immovable in the middle of the disturbance agitating the light of the Sun's limb. This proves that the agitation is factitious, that it is due to our atmosphere, and does not displace the direct image of the Sun. The effect is somewhat like that produced during the observation of stars near the horizon, where one sees the black lines remaining immovable in the midst of the incessant waves seen to traverse the spectrum. This leads me to the inquiry whether one would not gain considerably in precision in taking the passage of the solar disk with the help of a spectroscope: observations have shown me that there would be a sensible advantage in this course; but to render this system perfectly practicable, it would be necessary to fulfil certain conditions as to details, which I have not yet been able to accomplish.

“I have inquired whether the direction of the hairs of the chromatosphere might not be influenced by this agitation, but I have convinced myself that it is not so influenced to any extent. These hairs, which seem to us so fine, are veritable flames on the Sun, and it is natural that our atmosphere should have no influence upon them.

“It is seen, by all these results, how necessary it is that the observations of the prominences should be made in a continuous manner; and at least during one full solar spot period, in order that we may be enabled to compare the vicissitudes of the chromatosphere with those of the photosphere. The three last months have shown a medium activity of spots and prominences, in reality they seem to be reviving. I occupy myself, at present, in discussing the relations of the two phenomena, availing myself of the drawings which I have made during the year. The comparison of these drawings with the fine photographs of M. Capello, has convinced me that our drawings, without attaining the perfection

of photographic images, are nevertheless capable of being sufficiently useful to the science of the day.

"When the sky is not clear, the chromatosphere can still be observed, if the veil is simply caused by mists formed of water globules; one can see nothing if the veil is formed of small ice-crystals. With the aqueous veil, the bright line of the chromatosphere seems bordered by two very strong dark lines, which seem to detach it from the Sun; these lines are evidently due to the aqueous vapour in our atmosphere. The fact that the length of these lines increases with the density of the veil leaves no doubt as to their origin.

"Let me be permitted to return to the structure of the corona of which I spoke in my last communication, to remove objections which may be raised.

"The curvilinear rays lead us to think that there is a certain circulation there; but ought we to suppose this circulation to proceed like that produced on a calm planet warmed from outside? Not at all, unquestionably. We have in the Sun an element which deserves special recognition; it is not merely the ascensional motion of masses warmed below, but another cause, perhaps more potent, the material projection from within outwards, which one must also consider. Neglecting the resistance of the medium in which the solar emissions take place, we should have, taking the evaluations of most distinguished men of science, initial velocities capable of projecting matter beyond the sphere of solar attraction. No doubt these velocities are exceptional, and are attained only during the epochs of greatest activity. But if the ordinary velocities cannot project matter to such distances, they may well carry it as far as the limits of the visible corona, after which it would fall back upon the Sun, after having been cooled by dilatation and by radiation in space. These masses, in rising, feel the influence of the layers they traverse, which should modify their direction, and bend them into curvilinear threads if these layers themselves have a circulation of their own.

"According to these considerations, the solar corona would not be merely formed of a layer circulating quietly, but it would be broken by jets proceeding from the body of the Sun; its constitution could not be assimilated to that of an envelope in dynamical equilibrium, circulating according to the laws of rotation and of the difference of densities produced by lower heat.

"These considerations seem to me well fitted to enable us to appreciate and explain the movements and the curious curves which are presented in Lord Lindsay's photographs, as well as in the drawings by M. Liais and other observers."

Father Secchi's paper is accompanied by a series of tables resembling those which accompanied his former paper. As the evidence they afford accords in much the same way with his inferences, it does not seem necessary to reproduce these tables.